	A	B
1	Source	Page
2	Commentor57	16
3	Commentor57	17
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5	Commentor57	17
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7	Commentor57	17
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	A	B
9	Commentor57	17
10	Commentor57	17
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1	Comment
2	Dr. Frissell's declaration reiterates long-standing concerns that are well-grounded in the available scientific literature. Standing alone, Dr. Frissell's declaration amply demonstrates that Oregon forest practices regulations for private lands in Oregon's coastal area do not protect water quality and designated beneficial uses. But there is ample additional evidence to support his conclusions.10
3	Logging near streams destabilizes soils and hillslopes, generating accelerated sediment delivery and increased sedimentation. Statistically significant increases in suspended sediment occur following the clearcut harvest of stream side areas.11 Clearcut streams also show chronic sediment delivery and deposition with depths of fine sediment several centimeters thick.12 In fact, the length of the unbuffered riparian zone in otherwise clearcut basins is a good predictor of sediment yield that is independent of road area.13
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9	Riparian buffers function as filters of surface water flow from upland areas and provide effective limits on ground disturbance, both of which are important processes that prevent chronic sediment delivery to streams.14 Riparian buffers are generally effective at preventing direct physical disturbance and sediment and slash delivery to streams if they include limits on yarding practices.15 If riparian buffers are not required for non-fish bearing streams, they become a source of excess sediment to perennial, fish-bearing channel networks as sediment is transported downstream.16 Thus, the effectiveness of the overall system of riparian management zones in maintaining sufficiently low turbidity is diminished at a watershed scale due to inadequate buffers in headwater basins.17 Rhodes (2005: 23) summarized, "it has long been recognized that full protection of the area of vegetation within 200 to >300 ft of the edge of all stream types is one of the most important and effective ways to limit sediment delivery from upslope disturbances, as numerous independent assessments have repeatedly concluded, Anderson et al. (1993), USFS et al. (1993), Henjum et al. (1994), Rhodes et al. (1994), Erman et al. (1996), Moyle et al., 1996; USFS and USBLM (1997), Beschta et al. (2004), Karr et al. (2004)."
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16	Many landslides in clearcut units occur adjacent to streams and incipient drainages loaded with slash debris.18 Small, mobile slash debris introduced into stream channels creates jams that are more susceptible to catastrophic failure than larger debris accumulations.19
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18	Logging high-risk sites also significantly increases the risk of landslides and debris flows. Clearcut areas are more prone to slope failure than forested areas.20 For example, the frequency of debris torrents in clearcuts increased 4-9 times relative to the frequency in forested areas.21 Relative to intact forests, debris flows in cleared forests are more frequent after a 20 percent increase in rainfall intensity.22 Slumps and slump-earthflows can be reactivated or accelerated after being harvested.23
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31	Mass wasting events often deliver sediment to streams. Landslides in clearcuts are more likely to deliver to streams, and to impair water quality with episodic and chronic sedimentation, than landslides in forested areas.24 Debris flows in clearcuts travel farther than debris flows inforested environments,25 which increases the likelihood of delivery to streams.
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35	Sediment delivery to streams via mass wasting events drastically alters aquatic habitat. Where landslides reach coho streams, they can cause mortalities and/or impaired behavioral functioning of coho salmon. The delivery of sediment to salmon-bearing reaches can smother salmon eggs, affect salmon migration, and severely degrade spawning and rearing habitat.26
36	Turbidity can affect foraging by juvenile coho by reducing the distance within which they can detect prey.27 Debris flows elevate turbidity downstream and negatively affect aquatic species.28
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38	Elevated sediment delivery also increases turbidity that can impair salmonid sightfeeding and cause gill damage—both factors that can contribute to indirect mortality.29
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42	Increases in sediment delivery can further harm coho by contributing to increases in width/depth ratios in sensitive streams,30 which inevitably increases summer water temperatures even in the absence of the loss of shade.31
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1	Citation
2	10. Brazier, J. R., & Brown, G. W. (1973). Buffer strips for stream temperature control. Corvallis, Or.: Forest Research Laboratory, School of Forestry, Oregon State University.
3	11. Keim, R. F., & Schoenholtz, S. H. (1999). Functions and effectiveness of silvicultural streamside management zones in loessial bluff forests. *Forest Ecology and Management* , *118* (1), 197-209.
4	11. Jackson, C. R., Sturm, C. A., & Ward, J. M. (2001). TIMBER HARVEST IMPACTS ON SMALL HEADWATER STREAM CHANNELS IN THE COAST RANGES OF WASHINGTON. J. Amer. Water Resour. Assoc. 37:1533-1550.
5	11. Zegre, N.P. 2008. Local and Downstream Effects of Contemporary Forest Harvesting on Streamflow and Sediment Yield. Oregon State University, Corvallis, OR. 163 pp.
6	12. Jackson, C. R., Sturm, C. A., & Ward, J. M. (2001). TIMBER HARVEST IMPACTS ON SMALL HEADWATER STREAM CHANNELS IN THE COAST RANGES OF WASHINGTON. J. Amer. Water Resour. Assoc. 37:1533-1550.
7	12. Rashin, E. B., Clishe, C. J., Loch, A. T., & Bell, J. M. (2006). EFFECTIVENESS OF TIMBER HARVEST PRACTICES FOR CONTROLLING SEDIMENT RELATED WATER QUALITY IMPACTS. JAWRA , Vol 42, Issue 5 pages 1307-1327
8	13. Lewis, J., Mori, S. R., Keppeler, E. T., & Ziemer, R. R. (2001). Impacts of logging on storm peak flows, flow volumes and suspended sediment loads in Caspar Creek, California. *Land use and watersheds: human influence on hydrology and geomorphology in urban and forest areas* , 85-125.

	D
9	14. Gomi, T., Moore, R., & Hassan, M. A. (2005). SUSPENDED SEDIMENT DYNAMICS IN SMALL FOREST STREAMS OF THE PACIFIC NORTHWEST. Journal of American Water Resources Association, Vol 41, Issue 4 pages 877-898
10	15. Keim, R. F., & Schoenholtz, S. H. (1999). Functions and effectiveness of silvicultural streamside management zones in loessial bluff forests. *Forest Ecology and Management*, *118* (1), 197-209.
11	15. Rashin, E., Clishe, C., Loch, A., & Bell, J. (1999). Effectiveness of forest road and timber harvest best management practices with respect to sediment-related water quality impacts. 99-317. Washington State Department of Ecology, Olympia, WA.
12	15. Jackson, C. R., Sturm, C. A., & Ward, J. M. (2001). TIMBER HARVEST IMPACTS ON SMALL HEADWATER STREAM CHANNELS IN THE COAST RANGES OF WASHINGTON. J. Amer. Water Resour. Assoc. 37:1533-1550.
13	16. Rashin, E., Clishe, C., Loch, A., & Bell, J. (1999). Effectiveness of forest road and timber harvest best management practices with respect to sediment-related water quality impacts. 99-317. Washington State Department of Ecology, Olympia, WA.
14	16. Gomi, T., Moore, R., & Hassan, M. A. (2005). SUSPENDED SEDIMENT DYNAMICS IN SMALL FOREST STREAMS OF THE PACIFIC NORTHWEST. Journal of American Water Resources Association, Vol 41, Issue 4 pages 877-898
15	17. Rashin, E. B., Clishe, C. J., Loch, A. T., & Bell, J. M. (2006). EFFECTIVENESS OF TIMBER HARVEST PRACTICES FOR CONTROLLING SEDIMENT RELATED WATER QUALITY IMPACTS. JAWRA , Vol 42, Issue 5 pages 1307-1327
16	18. Gresswell, S., Heller, D., & Swanston, D. N. (1979). Mass movement response to forest management in the central Oregon coast ranges. Res. Bull. PNW-RB-084. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 32 p
17	19. MacDonald, A., & Ritland, K. W. (1989). *Sediment dynamics in type 4 and 5 waters: a review and synthesis* . PTI Environmental Services.

	D
18	20. Gresswell, S., Heller, D., & Swanston, D. N. (1979). Mass movement response to forest management in the central Oregon coast ranges. Res. Bull. PNW-RB-084. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 32 p
19	20. Pentec 1991
20	20. Benda, L., Miller, D., Dunne, T., Agee, J., and Reeves, G. 1998. Dynamic landscape systems, Chap. 12 in: R. Niaman and R. Bilby (eds.) River Ecology and Management: Lessons from the Pacific Coastal Ecoregion, p. 261-288
21	20. Robinson, E. G., Mills, K., Paul, J., Dent, L., & Skaugset, A. (1999). Oregon Department of Forestry Storm Impacts and landslides in 1996: Final Report. For. Pr. Tech. Rep, (4).
22	20. Montgomery, D. R., Schmidt, K. M., Greenberg, H. M., & Dietrich, W. E. (2000). Forest clearing and regional landsliding. Geology, 28(4), 311-314.
23	20. Guthrie, R. H. (2002). The effects of logging on frequency and distribution of landslides in three watersheds on Vancouver Island, British Columbia. *Geomorphology* , *43* (3), 273-292.
24	20. May, C. L. (2002). DEBRIS FLOWS THROUGH DIFFERENT FOREST AGE CLASSES IN THE CENTRAL OREGON COAST RANGE. Journal of the American Water Resources Association, Vol. 38, No. 4
25	21. Swanson, F. J., & Lienkaemper, G. W. (1978). Physical consequences of large organic debris in Pacific Northwest streams. GTR PNW-69
26	22. JF Franklin, D Lindenmayer, JA MacMahon, A McKee, J Magnuson (2000), Threads of Continuity, Conservation in Practice 1 (1), 8-17
27	23. Swanson, F. J., & Lienkaemper, G. W. (1978). Physical consequences of large organic debris in Pacific Northwest streams. GTR PNW-69
28	23. Zimmer (1984). Response of progressive hillslope deformation to precipitation. In Symposium on the Effects of Forest Land Use on Erosion and Slope Stability, p. 91-98. Environment and Policy Institute, East-West Center, University of Hawaii, Honolulu.
29	23. Benda et al 1988
30	23. Swanston, D. N., Lienkaemper, G. W., Mersereau, R. C., & Levno, A. B. (1988). Timber harvest and progressive deformation of slopes in southwestern Oregon. Bulletin Association of Engineering Geologists, 25(3), 371-381.

	D
31	24. Johnson, A. C., Swanston, D. N., & McGee, K. E. (2000). LANDSLIDE INITIATION, RUNOUT, AND DEPOSITION WITHIN CLEARCUTS AND OLD-GROWTH FORESTS OF ALASKA1. JAWRA Journal of the American Water Resources Association, 36(1), 17-30.
32	24. Guthrie, R. H. (2002). The effects of logging on frequency and distribution of landslides in three watersheds on Vancouver Island, British Columbia. Geomorphology, 43(3), 273-292.
33	24. Benda, L., Miller, D., Dunne, T., Agee, J., and Reeves, G. 1998. Dynamic landscape systems, Chap. 12 in: R. Niaman and R. Bilby (eds.) River Ecology and Management: Lessons from the Pacific Coastal Ecoregion, p. 261-288
34	25. Ketcheson, G. L., & Froehlich, H. A. (1978). Hydrologic factors and environmental impacts of mass movements in the Oregon Coast Range. Water Resources Research Institute Report, Oregon State University. Corvallis, OR, 94.
35	26. Spence, B.C., G.A. Lomnicky, R.M. Hughes, R.P. Novitzki. 1996. An ecosystem approach to salmonid conservation. TR-4501-96-6057. ManTech Environmental Research Services Corp., Corvallis, OR.
36	27. Spence, B.C., G.A. Lomnicky, R.M. Hughes, R.P. Novitzki. 1996. An ecosystem approach to salmonid conservation. TR-4501-96-6057. ManTech Environmental Research Services Corp., Corvallis, OR.
37	28. Cederholm, C. J., & Lestelle, L. C. (1974). Observations on the Effects of Landslide Siltation on the Salmon and Trout Resources of the Clearwater River, Jefferson County, Washington, 1972-1973: Final Report. Fisheries Research Institute, College of Fisheries, University of Washington.
38	29. Rhodes, J.J., McCullough, D.A., and Espinosa Jr., F.A., 1994. A Coarse Screening Process for Evaluation of the Effects of Land Management Activities on Salmon Spawning and Rearing Habitat in ESA Consultations. CRITFC Tech. Rept. 94-4, Portland, OR.
39	29. Lloyd, D. S., Koenings, J. P., & Laperriere, J. D. (1987). Effects of turbidity in fresh waters of Alaska. North American Journal of Fisheries Management, 7(1), 18-33.
40	29. Newcombe, C. P., & Jensen, J. O. (1996). Channel suspended sediment and fisheries: a synthesis for quantitative assessment of risk and impact. North American Journal of Fisheries Management, 16(4), 693-727.
41	29. Wood, P. J., & Armitage, P. D. (1997). Biological effects of fine sediment in the lotic environment. Environmental management, 21(2), 203-217.

	D
42	30. Richards, K, 1982 River:Form and process in alluvial channel, Methuen, London, 361 pp.
43	30. Rhodes, J.J., McCullough, D.A., and Espinosa Jr., F.A., 1994. A Coarse Screening Process for Evaluation of the Effects of Land Management Activities on Salmon Spawning and Rearing Habitat in ESA Consultations. CRITFC Tech. Rept. 94-4, Portland, OR.
44	31. Beschta, R. L., Bilby, R. E., Brown, G. W., Holtby, L. B., & Hofstra, T. D. (1987). Stream temperature and aquatic habitat: fisheries and forestry interactions. Streamside management: forestry and fishery interactions, 57, 191-232.
45	31. McCullough, D. A. (1999). A review and synthesis of effects of alterations to the water temperature regime on freshwater life stages of salmonids, with special reference to Chinook salmon.

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